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SELECTION AND TREATMENT OF SEED
POTATOES TO AVOID DISEASES



Treating Seed Potatoes

SELECTION AND TREATMENT OF SEED POTATOES TO AVOID DISEASES.

IN ANSWERING THE QUESTIONS "Shall we treat seed potatoes and how?" and "Will disinfection of the potatoes planted prevent disease?" it is important to call attention to the limitations of the methods, for seed treatment is effective against only a part of the common potato diseases and prevents this part only under certain conditions. Seed treatment is obviously without effect against foliage diseases, such as early-blight and late-blight, which must be combated by spraying in summer. Seed-borne potato diseases may be divided into three classes: (1) Those in which a lack of vigor and constitution is inherent in the tubers planted, (2) those due internal fungous or bacterial infection that can not be reached by treatments, and (3) those due superficial fungous or bacterial infection. Only the last class yields to external treatment.

PLANT VIGOROUS STRAINS.

To produce a full crop of healthy potatoes it is essential that the seed stock be sound and the product of vigorous and productive plants grown under favorable conditions.

Several of the worst potato troubles can not be detected by an examination of the tubers. Among them are the following:

Leaf-roll, a serious disease not yet fully understood, which is characterized by an upward rolling of the leaves, a yellow-green color, often with a purplish tinge, and greatly diminished yield. The tubers, which are small, are normal in appearance.

Mosaic, a disease widely prevalent on varieties of the Green Mountain and Bliss Triumph groups, which cuts the yield from 20 to 50 per cent. Readily recognizable in the field by its crimped, small foliage and mottled light and dark green leaves. The mosaic plant produces tubers which can not be distinguished from healthy ones.

Spindling sprout, another degenerative trouble, can not be detected until the sprouts appear, when they will be slender and thin, producing weak and unproductive plants.

Curly dwarf, a disease marked by diminished height, vigor, and productivity and by curled and imperfectly developed leaves, is another disease that can not be detected by an examination of the tubers.

Weakened vitality. Potatoes grown in the South in summer or in any locality where they are exposed to heat and drought are not safe to plant, as they are likely to be weak and unproductive as compared with stocks from more northern sources.

SELECT DURING GROWING SEASON FOR NEXT YEAR'S SEED.

The most efficient seed selection is conducted in the field in mid-summer, when it is possible to detect these degenerative diseases by the appearance of the foliage, and potato growers in the North should maintain a seed plat to grow stock for planting.

SPRING SORTING.

SELECT CLEAN STOCK FROM THE BINS.

The stock should be carefully worked over in the late winter or the spring to remove all seriously bruised or cut tubers, bad cases of scab and black scurf, decay of any sort, and abnormal discolorations of the interior, which can, of course, be detected only at the time of cutting.

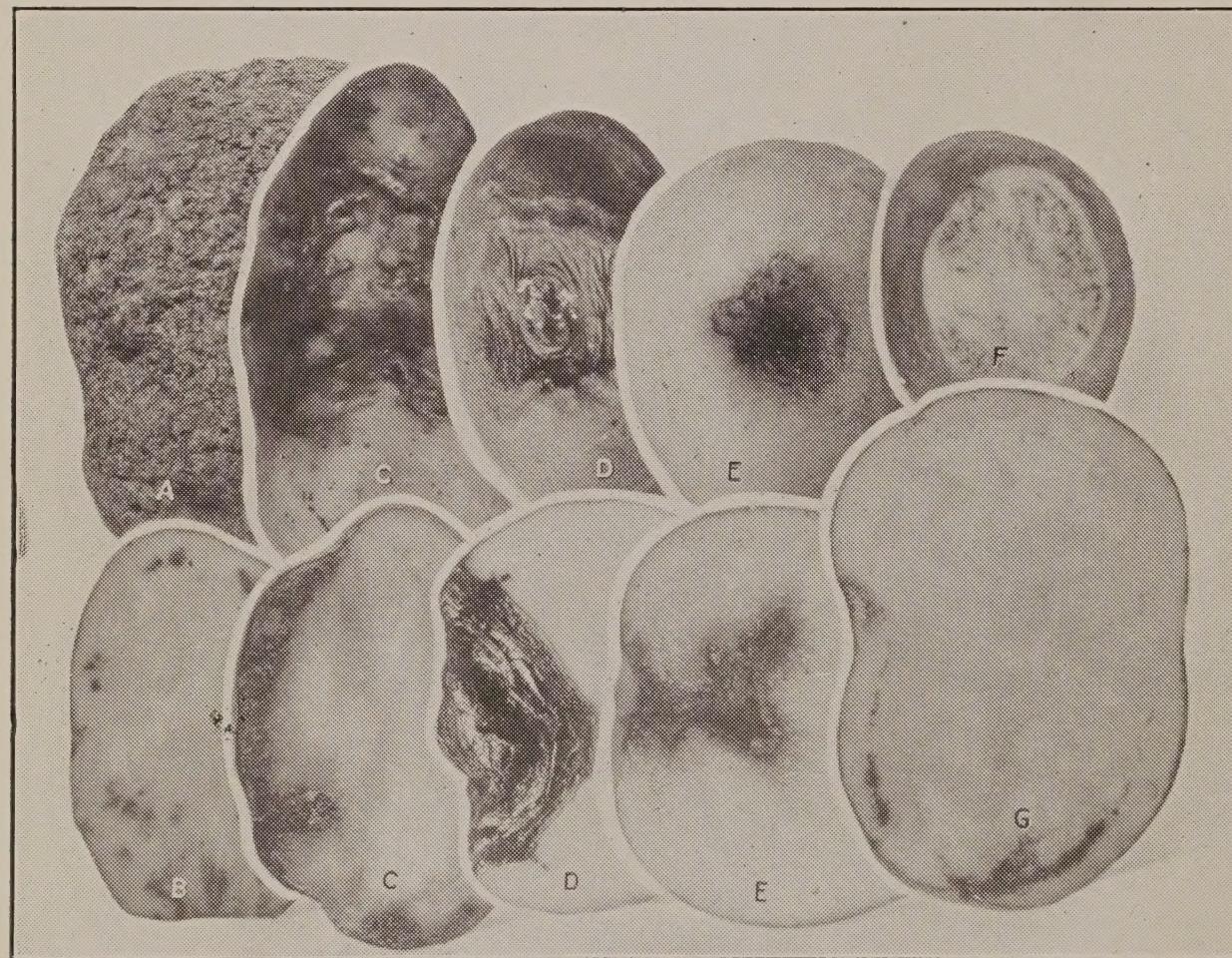


FIG. 1.—Potato diseases not controllable by treatment. Sort out and reject all tubers which look like these. (A) common scab, a severe case; (B) internal browning; (C) late-blight dry-rot; (D) Fusarium dry-rot; (E) black-leg tuber rot; (F) internal browning; (G) a wilt-infected tuber with discolored ring at the stem end.

The most common defects to be rejected are illustrated in figure 1. Very scabby potatoes, such as shown (A), may not sprout well, and the deep scabs are not always reached by the disinfecting solutions.

Late-blight dry-rot (C) is likely to prevent germination or to give rise to weak, diseased shoots, which become centers for the spread of late-blight. Seed pieces partially decayed by late-blight rot frequently

fail to grow, particularly in the South. It has also been proved that the fungus causing the late-blight of the tops grows up the sprouts in some cases and starts centers of infection, which either remain dormant or spread in the field, according as the weather conditions are unfavorable or favorable to the development of the blight. It is, therefore, evidently an advantage whenever possible to avoid seed bearing the late-blight decay.

Other dry rots (*D*), usually due to species of *Fusarium*, also impair sprouting, and the planting of diseased sets may infect the next crop.

Black-leg (*E*) is marked by a browning, followed by decay at the stem end, which spreads into the center of the tuber. Such potatoes should be rejected, and it is recommended that when the potatoes are cut the worker be provided with two or more knives in a glass fruit jar containing 4 or 5 parts of formaldehyde to 100 parts of water and that when a diseased tuber is cut the knife be dropped in the disinfectant and a fresh one used for the next tuber. This disease is perpetuated and spread by infected seed. It can be eliminated by thorough inspection and treatment of the seed and by removing diseased plants from the fields in early summer.

Wilt (*G*) is indicated by a dark ring at the stem end, although there are other factors that produce stem-end browning. Tubers showing a deep-seated discoloration at the stem end are in general unsuited for planting. It is not sufficient to cut off and throw away the stem end of affected tubers, for the wilt fungi penetrate deeply. The problem of dealing with this type of infection is a difficult one, particularly in districts where wilt is general, when it may be necessary to plant the best potatoes on hand. Whenever it is possible to secure clean and adapted stock it is advised that this be done in preference to planting lots that show a large percentage of deep stem-end browning.

Frost or chilling may seriously injure the quality of seed potatoes. The best guide in this case is the strength and vigor of the young sprouts.

Black-heart, due to overheating or lack of ventilation, may or may not impair the vigor of the sprouts, depending on the extent of the injury.

Hollow-heart, or overgrowth, is not to be classed with the diseases described. It will not be transmitted except to the extent that the variety used is subject to this condition. In soils where it occurs regularly, a change of variety or of cultural methods is desirable.

Silver scurf is a minor disfigurement and will usually be overlooked. Treatment does not seem to be effective in killing the fungus which causes this disease.

Net necrosis, a deep browning of the fibrovascular bundles, especially at the stem end, sometimes has a tendency to reappear in the next crop, and such potatoes had better be rejected.

TREAT THE SEED POTATOES FOR SCAB AND SCURF.

After a thorough inspection to eliminate potatoes unfit for planting (fig. 2) it is recommended that the selected stock be disinfected in

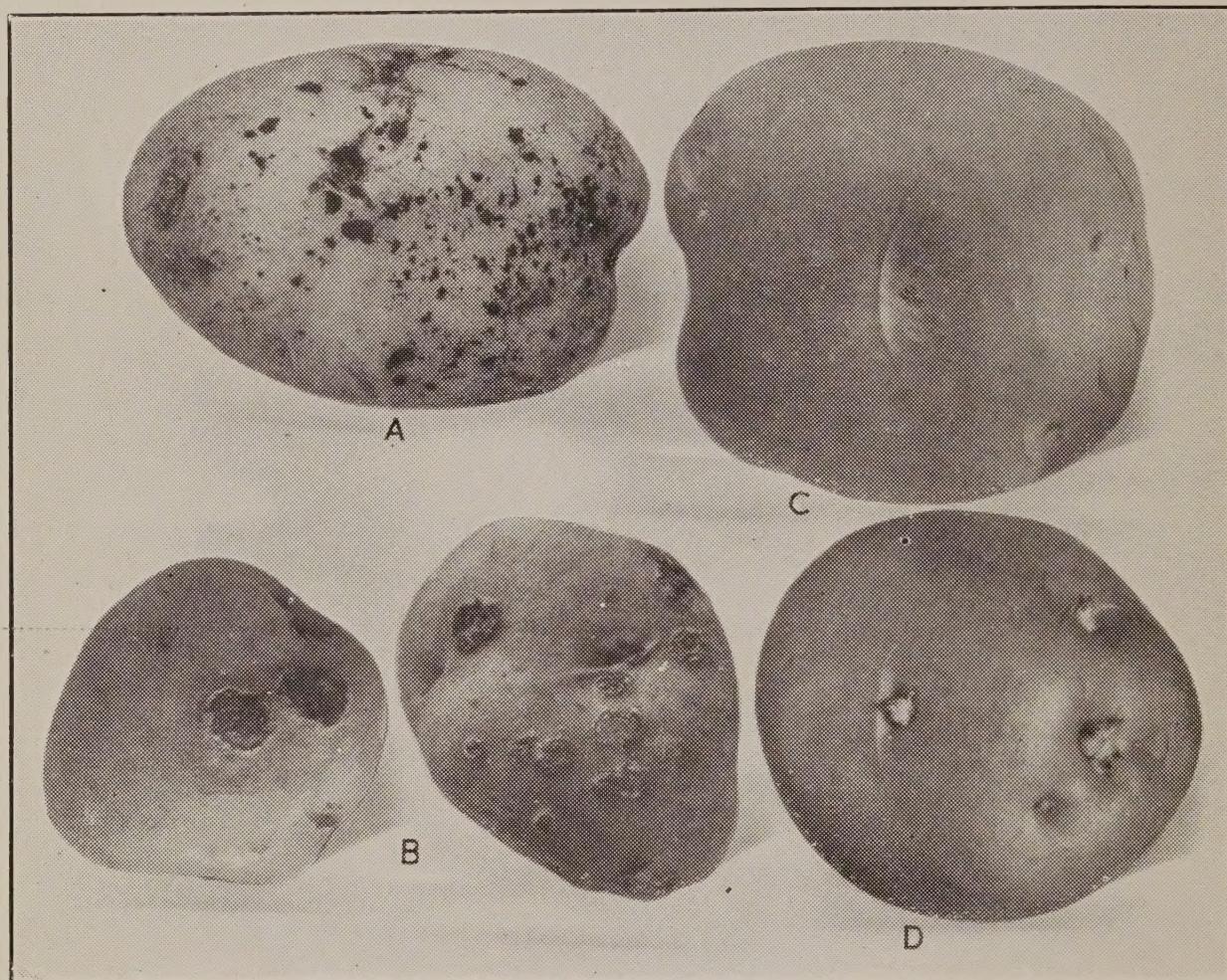


FIG. 2.—Potatoes that may be planted after treatment: *A*, Black scurf; *B*, common scab. Such potatoes may be planted after treatment, but it is better still to select perfect types of seed tubers, like those illustrated by *C* and *D*, for planting.

corrosive sublimate or formaldehyde. The object of this treatment is to destroy the germs present on the surface of the tubers and thus to prevent carrying disease to new land. Even on old land it is frequently an advantage to get rid of the infection on the seed tubers planted.

RELATION TO SOIL CONDITIONS.

Conflicting results are often secured from seed treatment. It has been shown that most potato diseases are not reached by disinfectants. It also happens that scabby potatoes may be planted in some soils and give a clean crop and that sound treated seed in other land will return only badly scabbed potatoes.

PRESENCE OF INFECTION IN THE SOIL.

It is known that both this scab organism and Rhizoctonia are widely distributed in the soil and that they are present in many fields where potatoes have never been grown, and even where no crops have been cultivated.

IMPORTANCE OF THE SOIL REACTION.

Scab is seldom troublesome in acid soils but is favored by alkaline conditions. For this reason lime, wood ashes, and fresh stable manure are to be avoided where scab is feared. When potatoes are grown in a rotation and liming is necessary, apply it after the potato crop. Rhizoctonia also is influenced in development by soil conditions, and both it and scab are imperfectly understood. Conditions vary in different sections, and the advisability of treating seed is to some extent a local question.

FORMULAS.

Corrosive sublimate (mecuric chlorid).....	4 ounces.
Water	30 gallons.
Soak the potatoes 30 minutes.	

A small volume of hot water should be employed to dissolve the corrosive sublimate, because it goes into solution very slowly in cold water. The solution must be prepared and used in wood, enamel, or concrete containers. It corrodes metal, using up the active principle of the solutions. It is not injurious to the hands, but is a deadly poison when taken internally by man or animals. Treated potatoes are unfit for domestic use or feeding. The solution grows weaker rapidly from use, even to the extent of losing as much as one-fourth of its strength during a single use. The loss is greater when sacks instead of crates are employed for dipping and is greater in treating dirty potatoes than clean ones. It is therefore advisable to add 1 ounce of dissolved corrosive sublimate to each barrel, together with enough water to bring the solution up to the original volume, after each batch of potatoes has been treated. When this has been done four times, use twice; then throw away the old solution and prepare a new one.

Formaldehyde (formalin).....	1 pint.
Water	30 gallons.
Soak the potatoes 30 minutes.	

This solution does not corrode metal and is not a dangerous poison. Potatoes treated with it may be baked or boiled and eaten with perfect safety. The diluted solution does not lose its strength on standing, as

is frequently stated; on the contrary, it grows stronger on evaporation, the water evaporating faster than the formaldehyde. It may safely be kept for a few days or weeks, if covered. This solution is not so generally effective as corrosive sublimate but is much cheaper.

METHOD OF TREATMENT.

To treat large quantities of potatoes, set several barrels on a slightly elevated platform, as shown in the illustration on the title-page. Fit a plug in a hole near the bottom of each barrel, fill the barrel with potatoes, cover with the solution, let stand for 30 minutes, draw off the solution, and pour into another barrel. Increase the number of barrels in proportion to the quantity of potatoes to be treated. Another method is to use a large wooden vat or trough, into which the potatoes in sacks or crates are lowered by a rope and pulley and later hauled out, drained, and dried on slatted racks.

WHEN TO TREAT.

Seed potatoes are usually treated just before planting. The work may, however, be done with equal success at any time in the winter or spring, provided the potatoes are properly dried and are not reinfected by storing in old containers or bins that have not been disinfected. It is, in fact, an advantage to treat some time in advance of planting, so that if the sprouts are injured, new ones may form.

It is often the practice to expose seed potatoes to the light for several weeks before planting, to green and sprout. When this is done the treatment should be applied first, as otherwise the sprouts would be injured and germination retarded.

Potatoes should be treated before cutting. After treatment sprinkle the cut pieces with flowers of sulphur or gypsum and spread in thin layers, turning over every day or two until the cut surfaces have calloused.

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Approved:

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Chief of Bureau.

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NOTE.—Prepared with the assistance of members of the staff of Cotton, Truck, and Forage Crop Disease Investigations and read and revised by C. R. Orton, M. F. Barrus, B. F. Lutman, G. H. Coons, H. S. Jackson, W. J. Morse, F. C. Stewart, G. R. Bisby, A. V. Osmun, R. E. Vaughan, I. E. Melhus, and O. R. Butler.